

Towards a variational complex for the finite element method

Variational and symplectic integrators are now popular for mechanical systems, both because of their good long term stability and qualitative fit. Such integrators mimic or inherit the Lagrangian, respectively Hamiltonian, structure of the continuous model. A variational complex is a theoretical tool for the rigorous study of Lagrangian systems and their conservation laws. This talk examines whether a formulation of a variational calculus for finite element methods, for an arbitrary finite element approximation scheme, is possible. The motivation is that this would allow the stability and the conservation laws of such integrators to be studied without any need for individual, *ad hoc* arguments. A number of examples are considered, mainly one dimensional, and conditions for a suitable complex derived.